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**Processed weight to live-weight conversion factors for Atlantic halibut
(*Hippoglossus hippoglossus*)
of the
Scotian Shelf and Southern Grand Banks**

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¹ La présente série documente les bases scientifiques des évaluations des ressources halieutiques du Canada. Elle traite des problèmes courants selon les échéanciers dictés. Les documents qu'elle contient ne doivent pas être considérés comme des énoncés définitifs sur les sujets traités, mais plutôt comme des rapports d'étape sur les études en cours.

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Abstract

This study re-examined processed-weight to live-weight conversion factors for the two common landed forms of Atlantic halibut. We weighed 2272 halibut live, and in the head-on and eviscerated form and determined a conversion factor of 1.135 (95% confidence interval = 1.134 - 1.138). We also weighed 534 halibut live, and in the head-off and eviscerated form and determined a conversion factor of 1.264 (95 % confidence interval = 1.256 - 1.272). We recommend that these conversion factors be adopted as the standards for this species.

Résumé

La présente étude constitue un nouvel examen des facteurs de conversion de poids transformé à poids vif appliqués aux deux formes sous lesquelles le flétan de l'Atlantique est généralement débarqué. Nous avons pesé 2 272 flétans vivants et sous forme de poissons éviscérés mais non étêtés et ainsi obtenu un facteur de conversion de 1,135 (intervalle de confiance de 95% de 1,134 - 1,138). Nous avons aussi pesé 534 flétans vivants et sous forme de poissons étêtés et éviscérés et obtenu un facteur de conversion de 1,264 (intervalle de confiance de 95 % de 1,256 - 1,272). Nous recommandons l'adoption de ces facteurs de conversion à titre de facteurs standard pour cette espèce.

Introduction

Where any on-board process that alters the weight of a fish prior to landing takes place, conversion factors must be determined to account for actual live-weight removals from the resource. In Atlantic Canada, Atlantic halibut are landed in two processed forms, head - on eviscerated, or head - off eviscerated. At present the live weight conversion factors used are 1.20 and 1.40 respectively. The majority of landings are in the head-on form. It is the stated opinion of many halibut fishermen that these constants are not accurate and lead to an overestimate of the live weight of halibut landed each year. We report on the results of a conversion factor study carried out as part of an industry / DFO sponsored longline survey for Atlantic halibut.

Materials and Methods

The halibut survey was designed in two phases (stratified random and a commercial index phases) covering the entire geographic area of the putative Scotian Shelf and Southern Grand Banks population. For the stratified phase about 200 pre-selected stations were fished using standardized protocols and fishing effort. During the commercial index phase each participating fisherman was allowed a total number of days to fish without restrictions other than existing closed areas, and a 7000 hook per day effort limit. All survey activities were monitored by certified fisheries observers. Detailed survey protocols are given in Zwanenburg (1999).

Data for estimating halibut conversion factors were collected during both phases of the survey. When sea states were considered amenable to obtaining reliable individual fish weights, all halibut were weighed to the nearest 50 g as they were taken aboard, and again following on board processing (either head - on and eviscerated, or head - off and eviscerated), using a spring balance. In addition to weight, each individual halibut was sampled for total length, and sex.

Results

A total of 2806 halibut were weighed as landed and following processing. Of these 2272 halibut were processed to the head - on and eviscerated form while 534 were processed to the head - off and eviscerated form. The geographic distribution of the sampled fish indicated that these were taken from the entire survey area (Figure 1).

The ratio of live weight to head - on and eviscerated weight was estimated to be 1.135 (95% confidence interval = 1.134 - 1.138). This ratio (Figure 2) demonstrated a slight negative trend with both fish weight ($b = -4.7E^{-7}$, $R^2 = 0.005$, $p < 0.000$) and fish length ($b = -2.6E^{-4}$, $R^2 = 0.007$, $p < 0.000$). The ratio of live weight to head - off and eviscerated weight was estimated to be 1.264 (95 % confidence interval = 1.256 - 1.272). The head-off conversion factor is not related to either weight ($b = -7.6E^{-7}$, $R^2 = 0.004$, $p < 0.07$) or length ($b = -3.4E^{-4}$, $R^2 = 0.002$, $p < 0.18$).

We found small but consistent differences in conversion factors for males and females. For the head-on form, males had an average conversion factor of 1.138 while females gave a conversion factor of 1.132. The difference for the head-off form was somewhat larger with males at 1.268 and females at 1.260 (Figure 3).

Discussion and conclusions

Landings statistics for Atlantic halibut presently use conversion factors of 1.2 and 1.4 to estimate live-weight removals from the head - on and head - off eviscerated landed forms respectively (Commercial Data Division, Program Coordination and Economics Branch, DFO Maritimes Region). These constants are listed as the standards in Statistical Coordinating Committee or the Atlantic Coast (STACAC) document No.2.

The conversion factor for the head-on eviscerated form estimated by the present study (1.135) differs from the presently applied (1.20) factor by 5.7%. The conversion factor for the head - off eviscerated form was estimated to be 1.264, which differs from that presently employed (1.4) by 10.8 %.

Devold (1938, Table 14) gives a head - off eviscerated conversion factor off 1.38 based on removal of the entire head by cutting around the gill covers. The published conversion factor for the head-off eviscerated form of Pacific halibut (*Hippoglossus stenolepis*, a closely related species) is 1.33 (Quinn et al 1983), who also indicate that heading practices in the west coast fishery give a head weight equivalent to 13.8% of eviscerated weight body weight. Our study indicates a head weight of 11.4 % of eviscerated weight. Although the work by Quinn et al (1983) does not give details on heading practices, in the Nova Scotia fishery only a portion of the head is removed (Figure 4). This is advantageous in that it maximizes the weight of fish sold to the on-shore buyer. The cut locations are also chosen to allow for "trimming" by the fish buyer. Since the flesh at the cut site becomes discolored making the fish less desirable to the consumer, the edge is trimmed to remove this discoloration just prior to final processing. Removing only a portion of the head allows the processor to trim the fish with minimal loss of marketable weight. The range of cut locations also explains the relatively wide confidence intervals calculated for the head-off form relative to the head-on form. The variance for the head -off conversion factor is higher than that for the head-on form. The higher variance is expected in that removal of the head is a processor specific activity with regard to where (anatomically) the head is removed. Evisceration is dependent solely on the volume of organs present.

This study represents the most comprehensive examination of live weight to processed weight for Atlantic halibut undertaken to date and demonstrates that the conversion factors presently being used for these two common landed forms are resulting in an overestimation of the actual weight of fish removed annually. The conversion factor of 1.2 presently applied to that head - on eviscerated landed form may overestimate the proportion of actual removals by approximately 5.7% annually, while the conversion of head-off eviscerated weights may overestimate removals by as much as 10.8%. However, given that the survey

is representative of the fishery as a whole and that the head-off form represents only about 20% of landings, the overall level of overestimation is likely to be about 7%.

We conclude that the conversion factor of 1.2 presently applied to the head - on eviscerated form should be changed to 1.14, and that the conversion factor of 1.4 presently applied to the head-off eviscerated form should be changed to 1.26. These changes will improve the accuracy of the estimates of live weight removal for these stocks.

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Figure 1. Set Locations for the 1998 halibut survey

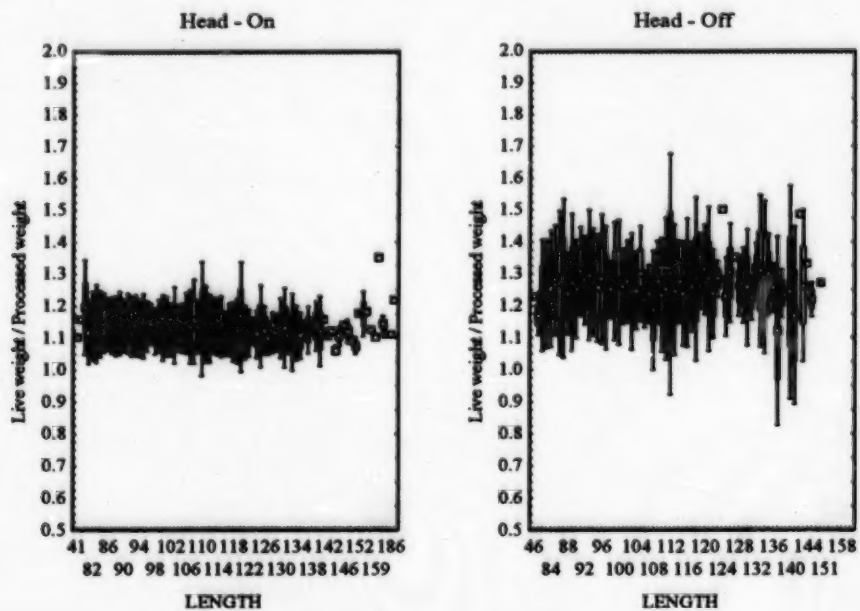


Figure 2. The relationship of conversion factor to length for Atlantic Halibut

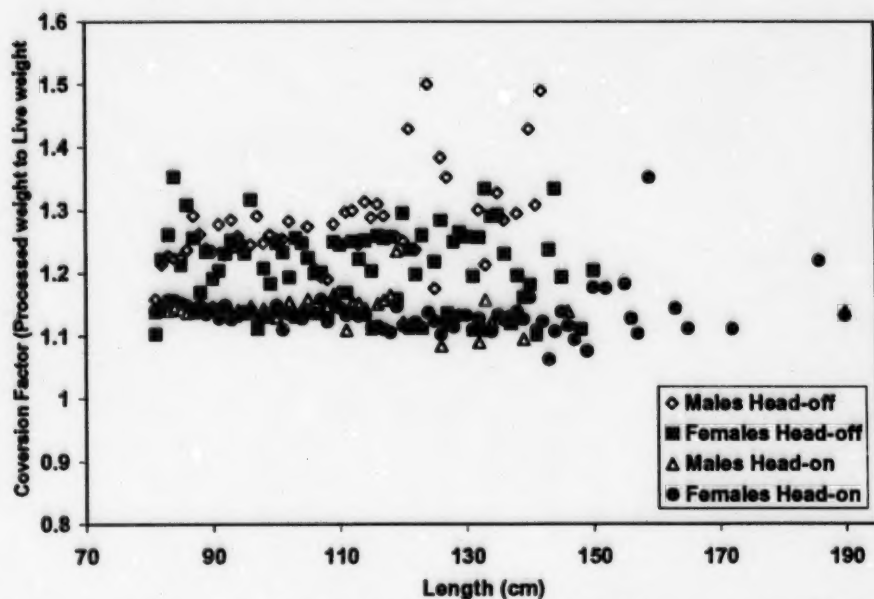


Figure 3. Processed weight to live weight conversion factors by length and sex for Atlantic halibut (*Hippoglossus hippoglossus*)

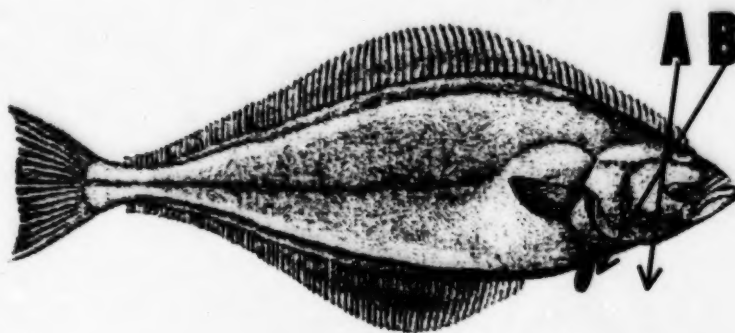


Figure 4. Estimated locations of cuts used to dress halibut landed in the head-off, eviscerated form to fish plants located in Nova Scotia. The exact location of the cuts lies between trajectories A and B and depends on the individual fisherman.